INTERNATIONAL RICE COMMISSION

NEWS LETTER

Issued by the I.R.C. Secretariat, c/o FAO Regional Office, Bangkok, Thailand.

No. 20 *December 1956*

SUMMARY OF RECOMMENDATIONS OF THE FIFTH SESSION OF THE INTERNATIONAL RICE COMMISSION

THE Fifth Session of the International Rice Commission met in Calcutta, India, 12-19 November, 1956, through the kind invitation of the government of India. It was attended by 58 participants, representing 16 countries and one other organization.

The Commission, having considered the various items on the Agenda of the Fifth Session, and having:

(a) commended the Working Parties on Rice Breeding and on Fertilizers, and the *ad hoc* Working Groups on Soil–Water–Plant Relationships in Rice Production, Mechanization of Rice Production, and Storage and Processing, for the good work they had carried out during the past two years; and

(b) generally approved the recommendations put forward by those Working Parties and *ad hoc* Working Groups, and considered the specific action that should be taken to further work in the various fields;

recommended that:

Improvement of Rice through Breeding

1. FAO should continue the work which has been developed under the Working Party on Rice Breeding, and in the planning of future activities should take into account the need for greater attention to the development of basic research, relating to the rice plant.

2. FAO should assemble in complete form the experience and results of the Rice Hybridization Project; and governments

should continue the testing of breeding material arising from this project and should make the results available to FAO.

3. FAO should organize a further training center on rice breeding, under the Expanded Technical Assistance Program, just as soon as finances and other factors permit.

4. FAO should continue to provide, also under the Expanded Technical Assistance Program, the services of a rice breeding expert to assist governments, particularly in Asia and the Far East, in the carrying out of the inter-country aspects of the rice breeding project. In this connection, the Commission noted that Dr. K. Ramiah, who had occupied this post for the last five years, was about to retire and expressed its appreciation for the good work he had done; the Commission also emphasized that, in filling the post, FAO should attempt to find an expert who has the particular qualifications necessary to coordinate work on the major aspects of the current program.

Improvement of Rice through Better Fertilizing Practices

5. FAO should continue the activities initiated under the Working Party on Fertilizers, in view of the need for effective means of facilitating exchange of information and developing cooperation among countries.

6. FAO should continue to provide assistance to countries in Asia and the Far East by continuing to make available the services of a soil fertility expert under the Expanded Technical Assistance Program.

Soil-Water-Plant Relationships

7. The *ad hoc* Working Group on Soil-Water-Plant Relationships should be reconstituted in a suitable form, for another two-year period, with somewhat enlarged membership.

Mechanization of Rice Production

8. Five to seven members from countries in Asia and the Far East and two to three from member countries outside this region, should be invited to form an advisory group on the technical aspects of mechanization, the exact form of the group to be determined by FAO.

9. If finances are insufficient to permit the implementation of all projects endorsed by the Commission, the appointment of a regional expert on farm management might be delayed in favour of other projects related to increases in production, upon which governments are prepared to take immediate action, pending the time when trained personnel are available to undertake active projects on the farm management aspects.

10. If funds are available, FAO should continue its work designed to assist governments in the establishment and development of national projects in the farm management field, with particular reference to rice, and in the training of

personnel for this purpose through training centers, issuance of publications and other means.

Storage and Processing of Rice

11. FAO should make suitable arrangements to continue the activities which had been initiated by the *ad hoc* Working Group on Storage and Processing of Rice since work in this field should constitute one of the major activities of the International Rice Commission.

12. In making provision for the continuation of this activity, full account should be taken of the need for attention to both the entomological and engineering aspects of storage, and to both the engineering and technological aspects of processing.

Action to Reduce Losses of Rice in the Field

13. FAO should take steps to develop intercountry cooperation with regard to the reduction of losses of rice in the field, and in so doing should take fully into account the need for coordinating this work closely with other activities sponsored by the Commission regarding rice production.

Fish Culture

14. Governments should ensure that there is close liaison between national departments concerned with rice and fish culture, thus making possible adequate studies of both the technical and economic aspects of fish culture in rice fields; and where fisheries departments do not have facilities for this work, the departments concerned with rice should obtain data on the yields of fish obtained from rice fields stocked under natural and artificial conditions.

15. The Executive Secretaries of the IRC and the IPFC should maintain close liaison in the development of this work and in the assembling and dissemination of results.

16. FAO should seek the assistance of the General Fisheries Council for the Mediterranean in gathering information which would contribute to the solution of this problem.

Utilization of Funds Remaining from the Rice Hybridization Project

17. FAO should apply the US$ 4,641.51 remaining from the contributions to this project to the publication of the Agricultural Study on "Rice" which had been prepared in FAO by Dr. K. Ramiah.

National Preparatory Groups

18. The Commission recommended that Governments should continue to give careful consideration to the possibility of establishing national groups to coordinate their activities related to the International Rice Commission, adapting the organizational arrangements to the requirements of the respective countries.

19. FAO should now organize the technical work related to the International Rice

Commission under two main working groups, dealing with:

(a) Rice production, including rice breeding, fertilizers, soil-water-plant relationships, protection of rice in the field, and related subjects such as agronomic practices, and crop rotations in rice production.

(b) Conservation, including the entomological and engineering aspects of rice storage, the engineering and technological aspects of rice processing, and the effects of these conservation measures on nutritive value of the rice.

(c) In making this recommendation the Commission expressed its appreciation for the good work done by the existing Working Parties and *ad hoc* Working Groups and commended to FAO the continued use of similar methods of work in furthering the activities of the Commission as well as the continuation of work already undertaken.

In implementing this recommendation, which will have to be carried out in stages, FAO should give due attention to the need for close collaboration among scientists within the more limited subject-matter fields, while at the same time ensuring close collaboration between the groups dealing with different fields and keeping at a reasonable level the total number of meetings required to handle the essential work. Simultaneous or consecutive meetings should be arranged whenever this is feasible.

Moreover in view of the growing importance of rice production and consumption in countries other than in Asia and the Far East, the countries interested should always be associated in the activities of the groups and be kept informed of the work of the groups or specialized subsidiary groups.

20. The Director-General of FAO in preparing his budget, and the Conference of FAO in approving that budget, should give full consideration to the need for adequate attention to rice. In this connection the hope was expressed that means could be found to employ specialists in the various phases of rice improvement, who could devote full time to work on this crop, since rice is the most important of the food grains and a large proportion of the world's population depend upon it as their basic food.

Time and Place of Sixth Session and Other Meetings

21. FAO should, in consultation with the Government of Ceylon, try to make arrangements to hold the Sixth Session of IRC (and any associated meetings) in Ceylon in 1958. FAO should also explore, with the Government of France,

the possibility of holding the Seventh Session in Madagascar in 1960, or possibly in 1958 if the proposal to meet in Ceylen cannot be implemented.

22. FAO should, in consultation with the Government of Australia, determine if the 1957 meetings of technical groups dealing with rice production can be held in that country. Alternatively, the possibility of holding the meetings in Italy should be explored. Further, FAO should explore the possibility of holding meetings of these groups in the United States of America in 1959.

SUMMARY OF RECOMMENDATIONS OF THE MEETING OF THE AD HOC WORKING GROUP ON STORAGE AND PROCESSING OF RICE

The meeting of the *ad hoc* Working Group on Storage and Processing of Rice took place in Calcutta, India, 5-10 November, 1956 through the kind invitation of the government of India. It was attended by 23 participants, representing 11 governments and one other organization. The following is a summary of its recommendations:

Concerning Field Practices Affecting Storage and Processing

1. Governments should undertake careful comparative studies of various field practices along the lines of the studies reported by the Delegate from France in order to determine the methods which will give a minimum of losses under the prevailing climatic conditions.

2. Governments should give increased attention to the introduction of small pedal, or other manually operated threshers, and should also undertake studies of the possibilities of threshing paddy while still wet, especially when the prevailing climatic conditions are unsuited to field curing.

3. Governments should give increased attention to the development of simple hand-operated equipment for winnowing grain at low cost, and winnowers should be designed which are suitable for local construction.

4. Governments should undertake studies to determine under which climatic and other conditions artificial drying, either with or without artificial heat, may be introduced with advantage. In the regions where natural drying has been proved preferable, such drying methods should be studied carefully. If artificial drying has to be preferred, attention should be paid to the further development of such driers, especially of small capacity and simple design. Special consideration

should be given to artificial drying with unheated air and to combinations of drying and storing equipment.

5. FAO should continue to collect and make available to member countries information on the above points, and particularly on driers suitable for use under tropical conditions.

Concerning Losses in Stored Rice

6. Governments should undertake studies leading to the development of practical, generally applicable techniques for accurate determination of losses in stored rice.

7. FAO should continue to assemble information on the extent of losses in stored rice, as new information becomes available, and should make it available to Member Countries as a means of emphasizing the need for greater attention to the reduction of such losses.

Concerning Existing Storage Facilities

8. FAO should obtain complete information on the construction, system of ventilation, operation costs, and other pertinent aspects of the experimental storage facilities which are being tested in the rice experiment stations in the U.S.A., and on other types of small storage structures that may be developed elsewhere; and that this information should be made available to member countries.

9. Governments should pursue investigations on the design of small storage structures, the development of storage facilities on a community basis, utilizing locally available materials, and should give particular attention to the development of adequate ventilating systems.

Concerning Preventive and Control Measures in the Protection of Stored Rice

10. FAO should obtain complete information on the legal dosages of insecticides which may be applied to grains in the various countries of the world and make this information available to member countries. FAO should also obtain and distribute information on the legal tolerances of insecticides on stored grains in each country.

11. FAO should obtain information on insecticide residues on stored grains, and make a study of the deterioration of such residues for the purpose of formulating recommendations to governments regarding direct mixing of insecticides with the grain. Meanwhile, governments should continue investigations on residues, and as new information is obtained, should communicate it to FAO.

Concering Recent Developments in the Control of Insect Pests

12. Governments should intesify investigations on safer, more effective, cheaper, and more practical means of insect control in stored grains.

13. In all investigations on the control of pests infesting rice, the quality and nutritive value of rice should be safeguarded.

Concerning Testing Equipment for Determining Quality and Potential Milling Results of Paddy

14. FAO should continue to collect and distribute information regarding suitable testing equipment for use to determine the quality and the potential milling yield of paddy, and the degree of whitening.
15. Governments should give special attention to research designed to develop equipment for the determination of degree of whitening of rice, with particular emphasis on the nutritional aspects.

Concerning Machinery and Methods for Cleaning and Grading of Paddy

16. Governments should undertake careful and detailed studies of the eventual economic advantages of cleaning and grading before milling, with a view to introducing economic practices in obtaining a higher yield of better quality rice. These studies should include a comparison of grading prior to milling and step-wise milling.

Concerning Marchinery and Method for Husking of Paddy

17. FAO should be requested to collect and disseminate further details on the cost of operation of the rubber-roll type of husker, with particular reference to the recoating and replacement of rubber-rolls.

Concerning Machinery and Methods for Whitening and Finishing of Rice

18. Governments should conduct comparative tests on various types of whitening machines and should give more attention to the factor of temperature, in relation to humidity, during processing.
19. Governments should give attention to safeguarding the nutritive value of rice during whitening and finishing operations, particularly with small units, as was suggested by the Nutrition Committee for South and South East Asia.

Concerning Separation of Products and By-Products and Marchiney and Methods for Grading Milled Rice and By-Products

20. FAO should collect and disseminate detailed information on the technological aspect of the fullest utilization of the by-products of rice, and regarding the type of equipment and machinery that possibly could be used in the utilization of by-products with particular reference to rural industries.
21. Governments should investigate the economic aspects of the utilization of such by-products as are available in their regions.

Concerning Layouts of Complete Processing Plants

22. FAO should continue to pay attention to mills which could be used advanta-

geously in rural farming communities, to secure continuous employment, resulting in a better standard of living.

23. Governments should encourage the establishment of rice-milling lay outs based on a sufficient number of machines, which ensure gentle and progressive processing, thus reducing heavy losses.

Concerning Equipment and Practices for Parboiling

24. FAO should collect and disseminate information on small parboiling plants, suitable for use in rural industries.

25. FAO should follow any new development on the parboiling of floating paddy and wet threshed paddy, and make the results generally available to governments.

Concerning Personnel Training

26. Governments should give careful attention to a study of the training facilities which exist within their respective countries, and to means of strengthening these facilities in order to provide more competent personnel at both the supervisory level and the operating level in their grain storage and processing plants.

27. In the light of these studies, governments should seek outside assistance where required in the development of more adequate facilities, either within the framework of the technical assistance provided to individual countries, or within the framework of regional projects provided for under the Expanded Technical Assistance Program.

28. FAO should maintain close contact with governments in order to acquire more precise information on their requirements, and on the progress being made in the improvement of their training facilities, and also to advise governments on study tours in other countries that they wish to organize for their own workers.

Concerning Proposals for Further Action

29. The International Rice Commission should consider proposing to the Director General of FAO the continuation of the *ad hoc* Working Group on a more or less permanent basis and that it should be constituted in two sections dealing respectively with (a) storage and handling, including entomological and engineering aspects, and (b) processing, including engineering and technological aspects. If the proposal is accepted, the member countries of the International Rice Commission should be asked to designate continuing representatives in the two sections of the Working Group, who would serve as liaison

points between their respective countries and FAO, and as contact points between the various countries.

30. The Working Group, if so established on a continuing basis, should carry out most of its work by correspondence, with particular attention to implementation of the recommendations of the present meeting, and with emphasis on the preparation of documentation on various aspects of storage and processing which are of greatest current interest to governments. Such documentation could be prepared by FAO staff members or consultants, or by experts in member countries, and could be made available to member countries as FAO publications, FAO working papers, papers in rice journals, or national publications (of which copies could be distributed to all other interested governments), and through other means. In this connection, governments might give consideration to the provision of special funds to cover the cost of such documentation, either directly or from commercial interests, the latter contributions being made through government auspices or through some other "neutral" channel, to avoid any favouratism to the product of a single manufacturer.

31. In order to forward the activities of the continuing Working Group, the Commission and the Director General of FAO should commend to governments, for favorable consideration and action, the recommendations in this report which are addressed to governments.

32. The Director General of FAO should consider the convening of technical meetings to deal with specialized aspects of storing and processing, as the need arises and as sufficient new information becomes available to justify such inter-country discussions.

33. In order that all available personnel and facilitices may be brought to bear on the more important problems of rice storage and processing, FAO should contact various members of the Working Group as soon as it is reconstituted in order to plan a coordinated approach to these problems. In this coordinated approach institutions in selected countries might undertake research on specific problems, also selected workers in countries might undertake the preparation of papers or monographs as proposed above, and in addition certain selected workers might be asked to serve as coordinators to prepare material for future meetings of the International Rice Commission, or of the Working Group, or for technical meetings on specific phases of storage or processing.

34. FAO is requested to continue the work on the glossary of rice terminology.

PROGRESS REPORT ON THE WORK OF THE INTERNATIONAL RICE COMMISSION FOR THE YEARS OF 1955 AND 1956[1]

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In accordance with the recommendation of its Fourth Session, held in Tokyo, Japan, in October 1954, the International Rice Commission is now embarking upon an expanded program of work to include the three newly organized *ad hoc* Working Groups on Soil-Water-Plant Relationships in the Production of Rice, Mechanization of Rice Culture under Wet Paddy Conditions, and Storage and Processing of Rice, in addition to the two well established Working Parties on Rice Breeding and Fertilizers. However, these two Working Parties will not meet this year but they are expected to hold their next meetings in 1957. This is necessary because both Working Parties are presently dealing with long range programs of work, which require a much longer time to produce results on one hand and the three *ad hoc* Working Groups have to be served on the other. It is planned from now on that the Commission and the two Working Parties will meet in alternate years.

It has been and still is the policy of the Commission to concentrate its effort on a limited number of projects at a time and to carry them on long enough to produce results and then to branch out into other fields of activity when conditions warrant.

Those recommendations that were made to FAO at the last Session of the Commission were either carried out or are in the process of being carried out. The present report summarizes only some of the highlights of the work of the Commission for the period under review.

1. 1955 Meetings of the two Working Parties.

The Sixth Meeting of the Working Party on Rice Breeding and the Fifth Meeting of the Working Party on Fertilizers were held in Penang, Malaya, from 5 to 11 December 1955 through the kind invitation of the United Kingdom. They were attended by 59 participants, representing 15 governments and 3 other organizations. During the meeting several excursion trips were arranged by the host government of the Federation of Malaya. The reports of these two meetings were already published as FAO Agricultural Development Papers and copies were made available to all member governments. They are now placed before the Commission for consideration.

2. Two more International Training Centers on Rice Breeding and Soil Fertility.

Two more international training centers were established in 1955 by FAO through the Expanded Technical Assistance Program in cooperation with the government of

1 *Read at the Opening Meetng of the Fifth Session of the Commission, held in Calcutta, India. 12-19 November, 1956.*

India. One was the Second International Training Center on Soil Fertility, which was held at the Main Agricultural Research Station of Hyderabad in Rajendranagar from 18 July to 15 October 1955. The course of instruction included lectures and demonstrations on field experimentation, principles of plant nutrition, fertilizers and their efficient use, soils and water relations, and soil testing for investigational and advisory services. It was attended by 32 trainees, representing 12 member governments. Most of them had B.Sc. or M.Sc. degrees.

The other one was the Second International Training Center on Rice Breeding, which was held at the Central Rice Research Institute, Cuttack, from 1 September to 30 November 1955. The course of instruction included lectures and laboratory exercises on principles of rice breeding, field experimentation and statistics. Twenty trainees attended the course, coming from 13 member countries.

The reports of these two international training centers were published by FAO and copies were made available to all member governments. These training centers were so successful that the two Working Parties at their last meetings in Penang, Malaya, in December 1955 unanimously recommended that further training centers be established in the near future.

3. Meeting of the ad hoc Working Group on Mechanization of Rice Production.

Seven member governments have designated representatives to serve on the *ad hoc* Working Group, including Burma, Ceylon, India, Japan, the Netherlands, Thailand and United Kingdom. The Working Group met in Peradeniya, Ceylon, from 14 to 18 May 1956 with five of the countries represented. Both technical and farm management aspects of mechanization of rice production received consideration at the meeting. The report of the meeting was published by FAO and copies were already made available to all member governments. A summary of the report is now placed before the Commission for consideration.

4. Meeting of the ad hoc Working Group on Storage and Processing of Rice

The *ad hoc* Working Group on Storage and Processing of Rice has just concluded its meeting in this Grand Hotel from the 5th to the 10th of this month. It was attended by 23 participants, representing 11 governments and one other organization. The report of the meeting is now placed before the Commission for consideration.

5. The ad hoc Working Group on Problems of Soil – Water – Plant Relationships in the Production of Rice

Five countries – India, Italy, Japan, United Kingdom and United States – have designated specialists to serve on this *ad hoc* Working Group. Largely for financial reasons the Working Group has not been able to meet so far. However, a background paper has been prepared through correspondence with the members of the Working Group and it is now ready for consideration by the Commission.

6. Farm Management Development Center

In response to the request made by the Commission at its last Session, a Farm Management Development Center has just been held in Tokyo from 15 October to 10 November this year. It was held by FAO in cooperation with the government of Japan. It was attended by 25 participants, coming from 8 countries. Further details will be reported to the Session when the item "Problems of Mechanization of Rice Production" comes up for discussion.

7. Publication of Water Lifting Devices for Irrigation

The importance of this publication has been repeatedly emphasized by the Commission in all its past Sessions. Thanks to the continued cooperation of the member governments, this publication is now available for distribution, as an FAO Agricultural Development Paper.

8. International Rice Hybridization Project

The International Rice Hybridization Project, which was started at the Central Rice Research Institute, Cuttack, in July 1950, has been successfully concluded the end of March 1956. Many participating governments have made one or more contributions toward its support. When the government of Ceylon made its sixth contribution it had to be returned because of an anticipated amount of surplus to be left over at the conclusion of the project.

Since the progress report on the technical aspects of the project will be made to the Commission in some other documents, the present report is limited to a financial statement on the project for the period from April 1954 to July 1956, as the previous report, which was made at the last Session of the Commission, covered the period from 1 April 1952 to 31 March 1954.

During the period under review, the total amount of receipts, including the fifth contribution from Ceylon, one contribution from the Philippines and support from FAO, together with the balance brought forward from the previous period was Rs. 95,038/8/6 against total disbursements of Rs. 77,935/11/6 for the project at the Central Rice Research Institute for the same period, thus leaving a balance of Rs. 17,102/13/0, or equivalent to US$ 3,591.51 in the account of the FAO Regional Office for Asia and the Far East. In addition there was one contribution of US$ 1,050 from Australia for Papua and New Guinea. It was made to FAO Headquarters in Rome and is kept there. Therefore the sum total of the surplus is equivalent to US$ 4,641.51. As to the disposal of the surplus fund, a separate proposal will be made later in the Session.

9. News Letter

The News Letter of the Commission has been regularly published since its beginning in the Spring of 1952, four issues a year. For the first 16 issues, an index was published. Copies of the September, 1956, issue, which is in fact a special issue on India, are now placed befor the Com-

mission. For the 1955 meetings of the two Working Parties held in Penang, two issues were published on the various problems of rice production in Malaya. It is hoped that similar issues can be published for the other countries where the future meetings are to be held.

In accordance with the recommendation of the Commission an effort has been made to make current literature on rice available to the readers. So far a total of six book reviews has been published in the past few issues. More literature reviews will be made in the future.

10. Preparations made for the Present Session

As regards the matter of preparations for the present Session, the host government of India in cooperation with the government of West Bengal has set a good example. At New Delhi a National Rice Commission was organized consisting of about 40 government officials concerned with the various problems of rice with the Minister of Agriculture as its chairman. A guide book for delegates was issued and a monograph on rice in India was prepared and is now available for distribution. It contains more than 400 pages, an exhaustive treatment on the problems of rice in one country. In addition there are study tours, well planned ahead of time. I am sure that all participants will find the meeting here both profitable and enjoyable.

Appendix A

Financial Statement of the International Rice Hybridization Project at the Central Rice Research Institute, Cuttack, India (from April 1954 to July 1956)

Date	Receipts		Disbursements	Balance
	From	Amount		
		Rs.	Rs.	Rs.
	Brought forward from previous Financial Statement	37,191/ 6/6		
Apr. 54			3,905/12/0	
May 54			3,260/ 8/9	
June 54			3,014/15/0	
July 54			2,644/ 8/9	
Aug. 54			3,758/12/0	
Sept. 54			3,239/ 7/9	
Oct. 54			3,302/14/3	
Nov. 54	FAO Fourth Contribution	46,475/ 0/0	3,446/10/6	
Dec. 54			2,890/ 9/0	

Date	Receipts		Disbusements	Balance
	From	Amount		
		Rs.	Rs.	Rs.
Jan. 55			3,053/11/0	
Feb. 55			2,788/12/0	
Mar. 55			2,803/ 1/3	
Apr. 55			3,247/14/0	
May 55			2,599/ 5/0	
June 55			2,507/ 2/0	
July 55	Ceylon Fifth Contribution	4,998/12/0	2,188/ 4/0	
Aug. 55			2,555/ 0/6	
Sept. 55			4,540/14/6	
Oct. 55			1,870/ 3/0	
Nov. 55			3,801/ 7/6	
Dec. 55			2,479/ 6/0	
Jan. 56			2,715/ 5/0	
Feb. 56	Philippines First Contribution	4,744/3/0	2,397/ 3/6	
Mar. 56	Transfer from Pot-Culture House Account	1,629/3/0	1,614/ 3/9	
Apr. 56			7,026/12/6	
May 56			–	
June 56			–	
July 56			283/ 0/0	
	Total	95,038/8/6	77,935/11/6	17,102/13/0

Note :

Apart from the receipts listed above there was a contribution of US $ 1,050.00 made by Australia for Papua and New Guinea to FAO Headquarters in Rome in 1955 and kept in the account of the Headquarters.

Appendix B

Financial Statement on the Construction of a Pot-Culture House (FAO/ETAP Fund) at the Central Rice Research Institute, Cuttack, India (from March 1954 to July 1956)

Date	Receipts		Disbursements
	From	Amount	
		Rs.	Rs.
	Brought forward from 31 March 1954	1,907/ 7/0	
Apr. 54			–
May 54			–
June 54			–
July 54			1,785/ 7/0
Aug. 54			–
Sept. 54			–
Oct. 54			–
Nov. 54			149/ 0/0
Dec. 54			–
Jan. 55			–
Feb. 55	Transfer from Rice Breeding Training Center Account	1,629/ 3/0	–
Mar. 55			–
Apr. 55			–
May 55			–
June 55			–
July 55			–
Aug. 55			–
Sept. 55			–
Oct. 55			–
Nov. 55			–
Dec. 55			–
Jan. 56			–
Feb. 56			–
Mar. 56	Transfer to Rice Hybridization Account		1,629/ 3/0
Apr. 56			–
May 56			–
June 56			–
July 56			–
	Total	3,536/10/0	3,536/10/0

A SUMMARY REPORT ON RICE IMPROVEMENT IN EGYPT IN 1955

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This report summarizes some of the most important results of the rice improvement program conducted by the Rice Branch of the Plant Breeding Section in the Ministry of Agriculture of the Egyptian government in 1955 for the purpose of increasing rice production.

1. Breeding

(a) Breeding for a still better variety

The present improved variety, Y.M. 47, has been in general cultivation for sometime and in 1955 the total area grown to this variety was 92,400 hectares, nearly 38 per cent of the total rice area of the country. The average yield of this variety in 1955 was 5.44 tons per hectare, which is one of the highest yields of rice in the world.

An effort is being made to find a still better variety which can out-yield Y.M. 47 in order to increase rice production in the country.

Hence several trials were conducted in 1955 including 211 strains from crosses made several years ago, and 160 new varieties recently introduced from abroad. Results from these trials have given us hope that our objective of finding a variety better than Y.M. 47 might someday be achieved. The following table presents the data obtained in 1955.

Table 1. Promising Varieties Yielding Significantly Higher than Y.M. 47 in 1955. (tons/hectare)

Trial	*No. of varieties under trials*	*Average yield of the promising varieties*	*Average yield of Y.M. 47*
Miniature B	1	7.89	7.11
Miniature A	9	10.11	8.00
Preliminary Trial	15	6.11	4.37

Miniature B was a trial conducted in four different places, and the results obtained therefrom may, therefore, be considered fairly reliable. This promising variety is a selection from a cross between U.S. 3 x Y.M. 2 presently in its F_7 generation. It was one of the six strains found yielding significantly higher than Y.M. 47 in 1954.

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3 Chief of the Rice Branch of the Plant Breeding Section.

4 Rice Breeders of the Rice Branch of the Plant Breeding Section.

Miniature A was conducted in 2 places, namely: Sakha and Gemmeiza. The 9 varieties under test were found yielding significantly higher than Y.M. 47, in both places. Their yield in 1954 was also higher.

The Preliminary Trial, however, was only conducted at Gemmeiza, and the varieties included in this trial had been grown only in an observation plot in 1954, in which no yield data were taken; and therefore the data obtained from the 1955 trial were only introductory.

It is very encouraging to be able to find these promising varieties although they will have to go through further tests.

(b) Breeding for soil fertility response It is obvious that one of the most effective ways of increasing yield per hectare is to use more fertilizers, but our standard variety, Y.M. 47, will yield best when grown in a field receiving 240 kgs. of ammonium sulphate per hectare, which is much lower than the optimum rate used in such other countries as Japan and Italy where almost twice this amount is used. This is due to the difference of the varieties of rice in their ability to respond to the fertilizers used.

In Gemmeiza, a trial consisting of 240 varieties was conducted in three adjacent fields each receiving a different level of fertilizers, namely: 240 kgs., 480 kgs., and 720 kgs. of ammonium sulphate per hectare.

The yield of Y.M. 47, our standard variety, showed no response to these three levels of fertility while a total of 53 other varieties responded appreciably although their response was not uniform.

(c) Breeding for a kind of amphibious rice Since there is a water shortage from May to July, we had designed a trial consisting of upland and drought resistant varieties and it was conducted in a field receiving irrigation once every 17 days during these months. It was estimated that the total amount of irrigation water thus used during this period was about 36 per cent of that normally applied for growing lowland rice.

Several varieties were found very promising, as indicated in Table 2.

Table 2. Promising Varieties of Amphibious Rice under Test, 1955.

Variety	*Yield per hectare (tons)*	*Date of Heading*
Philippine 37	4.14	16/9
„ 35	4.17	13/9
„ 64	4.40	18/9
„ 33	3.57	14/9
Cross 102/16	3.54	31/8
102/28	3.63	30/8
111/1	3.63	31/8
111/15	3.68	12/9
138/11	3.14	30/8
Y.N.A. 44	2.57	–

The Philippine varieties listed above are about two weeks later in their date of heading than those selections from the crosses. New crosses of Philippine 64 with Y.M. 47 were therefore made in an attempt to combine the high yielding quality and earliness of Y.M. 47 with the high drought resistance of Philippine 64 into a new strain.

The four Philippine varieties and Y.N.A. 44 had also been tested in 1954. Their yields in these two years were very much related as shown in Table 3.

Table 3. Yields of the 5 Amphibious Rice Varieties, tons/hectare, in 1954 and 1955.

Variety	*1954*	*1955*	*Average yield*
Philippine 64	7.63	4.40	6.02
„ 37	7.40	4.14	5.77
„ 35	5.71	4.17	4.94
„ 33	5.28	3.57	4.42
Y.N.A. 44	4.03	2.57	3.30

(d) Breeding for a long-grained variety Long-grained rice commands a high price, especially in Europe. From our previous tests a strain called Giza 35 selected from a cross between Yabani Mont. 3 x Java 3 is a long grain variety, which was tested together with Y.M. 47 in 4 places. The following table summarizes the data thus obtained.

Table 4. Yields and Milling Qualities of Giza 35 and Y.M. 47.

Variety	*Av. yield (tons/hectare)*	*Milling out-put (whole grains)*	*Broken grains*	*Total*[1]
Giza 35	6.74	49.8%	18.9%	59.2%
Y.M. 47	7.86	61.4%	8.1%	65.4%

At this rate of yield, if the paddy of Y.M. 47 is priced at LE.18 per ton, Giza 35 should be sold at least at LE.21; and at this milling output, if the price of the milled rice of Y.M. 47 is fixed at 3.2 piastres per kg., Giza 35 should be sold at 4.1 piastres; otherwise both the growers and millers would suffer a loss due to the lower yield and lower milling output of Giza 35.

From our trials in 1955, we have at least found from both crosses and American introductions 8 varieties and strains, whose grains are long and fine. Their yield was also fairly high, but no final conclusions can be drawn at this early stage of experimentation.

(e) Breeding for resistance to salinity Most of the newly reclaimed land near the Mediterranean coast is of high salinity, and only such variety as Agami Mont. 1 can be grown successfully in such land. Our recent trials with new varieties and crosses indicate that Agami Mont. 1 is still one of the best varieties for such purposes.

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1 *Assuming that the price of broken rice is half of that of whole grain rice, the total is the sum of the whole grain output and half of the broken grain output.*

(f) Breeding for a late variety to be grown in the Nile Valley The Nile flood comes in early August. In some places such as Fayum, rice is broadcast as late as in the middle of July due to the availability of water from the Nile. This sort of rice is locally called *nily* rice.

Now if the planting of rice could be delayed, it would mean that less water would be consumed during the water shortage period, but unfortunately the later the rice is planted, the lower the yield is.

Two separate trials were then conducted: one to find a suitable variety to be sown in the middle of July and the other to find a variety that can be sown in nursery beds in the usual time but the transplanting is to be delayed.

Our present best variety for growing in the Nile valley is U.S. 3, which yields much higher than the common variety of *nily* rice known as Sabaini. However, the following table will show some varieties that are still better than U.S. 3 in yields.

Table 5. Five Outstanding *Nily* Varieties found in 1955.

Variety	*Yield per hectare (tons)*	*Diff. with U.S. 3 in percentage*
Cross 119/26	1.31	+ 33.0
120/12	1.49	+ 33.8
122/1	1.56	+ 39.7
122/8	1.41	+ 26.4
Y.N.A. 28	1.44	+ 45.8

A total of 311 varieties was sown in a nursery on 27 April, 1955, and their seedlings were transplanted on the 10th of July, 74 days after sowing. Field observations on tillering and maturity were made prior to harvesting in the end of October. A total of 95 promising varieties has been selected for a further test in 1956.

2. Improvement of Cultural Methods

From experiments it was found that rice by transplanting would yield 13 per cent more than by broadcasting, the best sowing time was from 5 to 25 May, and rice must be transplanted at the age of 25 to 40 days. Any delay in these operations will greatly reduce the yield. Transplanting with 3 to 4 seedlings per hill is enough, and any increase in this number is simply a waste. Maximum yields could be obtained by using 120 to 240 kgs. of ammonium sulphate together with the same amount of superphosphate per hectare. To use ammonium sulphate alone is not advisable at all. Weeding is essential and is more easily done by a weeder than by hand. Rice must be harvested not later than 45 days after heading. The Japanese pedal thresher recently introduced has proved very successful. The paddy thus threshed are cleaner, containing much less mud balls which are difficult to remove.

(a) Methods of fertilizer applicatoin When ammonium sulphate is broadcast in the paddy field, NH_4 is oxidized and becomes nitrate NO_3. And if any part of this nitrate should pass down to the lower layer of the soil it will be reduced to atmospheric nitrogen, which can be lost through evaporation. Such loss may be as much as 50%.

A trial consisting of treatments of applying ammonium sulphate and superphosphate to the surface and the subsoil layer was conducted in 1955 in both Gemmeiza and Sids. Results are presented as under:

Table 6. Yields from Treatments with the Surface and Deep Applications in 1955.

	Yields in tons per hectare	
Methods of application	*With ammonium sulphate*	*With superphasphate*
Deep application	7.66	7.51
Surface application	7.23	7.39

The deep application of ammonium sulphate yields significantly higher than surface application, while the difference between deep and surface applications of superphosphate was not so significant.

A similar trial to study the methods of applying ammonium sulphate was also conducted in 1954, and the results obtained are given as under:

Table 7. Different Methods of Applying Ammonium Sulphate and their Effects on Yields in 1954 and 1955.

	Yields in tons per hectare		
Methods of application	*1954*	*1955*	*Average*
Deep application	6.83	7.66	7.24
Surface application	6.28	7.23	6.76

The average yield of the deep application was 7.24 tons per hectare as against 6.76 tons for surface application, their difference being statistically significant.

An increase of 480 kgs. of paddy per hectare by deep application is worth our attention, as to apply the fertilizer deep into the subsoil can be easily done, with no great extra cost to the growers.

Since no difference in yields was found from the two methods of applying superphoshate, it becomes obvious that superphosphate should be applied together with ammonium sulphate at the same time so as to simplify the operation.

(b) Irrigation trails The irrigation system now in force for paddy cultivation

is that the canals are filled with water for 4 days followed by 4 days of drying. Trials were conducted in 1954 and 1955 to study the possibility of prolonging the interval of the drying period. The results are given as follows:

Table 8. Yields from the Various Irrigation Treatments in 1954 and 1955.

Irrigation treatments[1]	*Yields in tons per hectare*		
	1954	*1955*	*Average*
4 days watering × 4 days drying	6.03	5.31	5.67
4 „ „ × 6 „ „	5.57	5.14	5.36
4 „ „ × 8 „ „	5.63	5.03	5.33

The yield of the above 3 treatments was practically the same, indicating no decline in yield when the drying period was prolonged from 4 days in the first treatment to 8 days in the third treatment.

(c) Trial with double cropping system A trial was conducted to interplant a comparatively late variety, Giza 35, in between the rows of an early variety, Y.N.A. 11.

In addition to one harvest from each of the two varieties as expected, a third harvest was reaped from the ratoon crop of the early variety. The yields obtained from the three harvests are given as under:

First harvest from Y.N.A. 11 on 6/9 . . . . . 3.37 tons/hectare
Second harvest from Giza 35 on 18/10. . . . 0.86 „ „
Third harvest from the ratoon crop
of Y.N.A. 11 on 18/11 . . . . . 0.34 „ „
Total 4.57

Although the total yield of the 3 crops was still lower than that of a single crop of Y.M. 47 which yielded 5.46 tons per hectare in this trial, the above results did reveal a very significant fact, that is the possibility of raising two or three crops in the same year. It is also interesting to note that the yield of the ratoon crop was found as much as 10% of that of the main crop, which is after all an extra income to the growers.

(d) Methods of growing nily rice The farmers usually sow their *nily* rice directly to the field in the middle of July. At Sids a trial was conducted using 3 treatments, namely: (1) sow the seeds in the nursery on 15/4, and transplant the seedlings on 15/7; (2) sow the seeds in the nursery on 25/6 and transplant on 15/7; and (3) broadcast the seeds directly to the field on 15/7. The yields from the 3 treatments are presented below:

1 *The treatments in 1955 were modified to 3 × 5, 3 × 7 and 3 × 9, instead of 4 × 4, 4 × 6 and 4 × 8 as in 1954.*

Table 9. Yields from the Three Methods of Planting in tons per hectare.

Methods of planting	*Average yield*
Transplanting 30 days after sowing on 15/6	3.66
Transplanting 20 days after sowing on 25/6	2.57
Broadcasting on 15/7	1.51

The yields from these three methods were significantly different from each other. The first method out-yielded the broadcasting method by 142 per cent, but it required some water to raise rice seedlings, at the time when there is a water shortage. However, since seedlings raised from one hectare of nursery would suffice to transplant at least 7 hectares of field, it becomes very explicit that the effort to get water in the middle of June for raising nurseries would greatly increase rice production in the Nile Valley.

Even near the end of June should water become available, the transplanting method is still preferred as the yield of the treatment (2), which was to sow the seeds in the nursery on 25/6, surpassed that of the broadcasting method by 70 per cent.

All this is in agreement with the general theory that the earlier the rice is sown, the higher its yield will be.

THE EFFECT OF CROP ROTATION ON GROWTH AND YIELD OF PADDY

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Itroduction

Wet paddy cultivation in Malaya is virtually confined to alluvial clay soils, and many of these dry out very hard in the off-season while others, particularly those of the coastal regions of Perak and Selangor, remain swampy and support a vigorous off-season growth of sedges and other aquatic plants. Neither of these conditions favours off-season cropping; irrigation of the former type is rarely possible and hand watering is arduous and applicable only to small patches of vegetables or other high-value crops.

There are, however, certain favoured localities where regular rotation of paddy with other crops is possible and a short account will be given of practice and investigations in these areas.

The Tanjong Karang Irrigation Area, Selangor

Certain portions of this large irrigation area on the Selangor coast are relatively well drained in the off-season, while the surface soil of muck or shallow peat is both easy to cultivate and retentive of moisture. In each year a variable acreage is cultivated in the off-season with dry-land crops, particularly maize, but appreciable areas are also planted with soya beans, tobacco and such foodcrops as pumpkins and tomatoes. The extent of cultivation depends partly on the energy of the cultivators but also on economic factors such as the price of rubber and of maize. The approximate areas cultivated during the last three seasons were as follows:

1953 – 1,550 acres
1954 – 2,965 „
1955 – 1,685 „

In 1953 the area cultivated was reduced by resettlement dictated by the emergency, while the high price of rubber has this year caused some loss of interest since rubber tapping has proved to be more remunerative than farming.

The soils in the Tanjong Karang area are very fertile and it is not normal practice to manure either the paddy or the off-season crops. Nevertheless the latter give satisfactory yields and the wet paddy is some of the heaviest-yielding in the country, yields of 800 to 1,200 gantang per acre having been recorded (5,022 to 7,532 kgs. per ha.). Farmers in the area maintain that off-season cropping does not reduce the yield of the subsequent paddy crop and there is circumstantial evidence that the practice is wholly beneficial. Certainly weed control in the paddy is very much easier after a dry land crop than following fallow. Furthermore, the surface cultivation required by the dry-land crops appears to improve soil structure and it seems possible that the known beneficial effect of drying out wet paddy soils in the off-season is enhanced by cultivation. In theory, this benefit would be a result of the accumulation of nitrate nitrogen in the topsoil in consequence of the mineralization of the soil organic matter.

In April 1953, a field experiment was designed to test the effect of wet and dry off-season cropping in this area, the planned treatments being as follows:

W – Soil kept flooded in the off-season } cropped with Taiwan paddy or sedged fallow

D – Soil kept drained in the off-season } cropped with maize or dry fallow.

There have been considerable difficulties in carrying out this trial, partly due to the close proximity of the wet and dry treatments since the sub-soil has proved to be very permeable. Flooding and pest damage have also contributed to these difficulties and no results of value have yet been obtained. Nevertheless the experimental *batas* (bunds) have now had plenty of time to settle and this factor, taken in conjunction with recent improvement to drainage, makes it probable that valuable results can reasonably be expected in 1956 and subsequent years.

Experiments in Province Wellesley

Experiments carried out at the Bukit Merah Paddy Experiment Station before the war have shown that off-season cultivation leads to increased yields of paddy in the first few years. Provided that manuring is practised, satisfactory crops can usually be harvested from groundnuts, sweet potatoes, ladies fingers, brinjals and cowpeas (2). The provisional conclusion was reached that, at least in the first few years, it was the cultivation for the off-season crops and not the manuring, which produced the subsequent increased paddy yield.

In order to study this effect over an extended period a trial was laid down in 1947 with the folllowing treatments:

A Normal fallow in off-season
B Fallow growth manured
C Sweet potatoes cultivated without manure
D Sweet potatoes cultivated with manure
E Groundnuts cultivated with lime.

From 1947 to 1950, plots receiving Treatments B and D were split, half being manured with buffalo manure at 10 tons per acre and the other receiving 3 cwt. per acre of an NPK mixture containing the following fertilizers:

Sulphate of ammonia	– 95 parts by weight
Superphosphate (18 % P_2O_5)	– 117 parts by weight
Muriate of potash	– 16 parts by weight

This layout proved to be unsatiafsctory and, from 1951 to 1954, the whole plots were manured with 5 tons per acre of buffalo manure plus 2 cwt. per acre of NPK. In all cases the plots planted with groundnuts were manured with 30 cwt. per acre of ground limstone.

Yields from the sweet potato crops were usually poor, with a large percentage of

tubers damaged by weevils. In some years the crop was negligible owing to flood damage. Groundnuts proved to be much more suitable and crops were usually satisfactory and often quite good. In later years crop improved as the staff acquired skill and experience.

The effects of off-season cropping on subsequent yields of paddy are summarized in Table 1.

Table 1. Effect of Treatments on the Paddy Crop (lbs. grain per acre).

Season	Manure minus No Manure	Significance	Sweet potatoes minus Fallow	Significance	Mean yield of paddy
		per cent		per cent	
1947–48	278	1	473	1	2,121
1948–49	110	0.1	580	0.1	2,734
1949–50	5	N.S.	23	0.1	174
1950–51	122	N.S.	16	N.S.	1,506
1951–52	94	N.S.	285	0.1	2,300
1952–53	130	N.S.	353	0.1	2,087
1953–54	174	1	441	0.1	2,013
1954–55	171	1	473	0.1	2,010

From the information contained in Table 1, it can be concluded that good cultivation in the off-season benefitted the subsequent paddy crop in seven seasons out of eight and that manuring the crop was only of benefit to the subsequent paddy crop in four seasons out of eight.

This conclusion pre-supposes that the technique of off-season cultivation has been mastered: if cultivation is too deep the following paddy crops may suffer.

Experiment in Perak and Pahang

One type-of-cultivator trial carried out at Dong Paddy Test Station, Panang, in 1950-51 had the following sub-treatments:

VO – Off-season crop, unmanured
VM – Off-season crop, manured with NPK
C – Control, no off-season crop.

Mean yields of the subsequent crop of paddy were:

VO – 3,020 lbs. per acre
VM – 3,080 lbs. per acre } ± 93.5
C – 2,460 lbs. per acre

It was noted that the manured plots were more weedy than the unmanured ones but yields did not differ appreciably. However, the effect of off-season cropping was to increase the subsequent paddy crop by 560 lbs. per acre of grain and this was highly significant ($P > 0.001$). In this trial the off-season crops failed and it was not repeated.

Similar experiments were carried out at the Talang and Briah Padi Experiment Stations in Perak between 1951 and 1954 but for one reason or another the off-season crops failed, often because of unsuitable weather conditions for cultivation and planting. In only one instance did such off-season cultivation have a beneficial effect on the subsequent yield of paddy, namely when crops of groundnuts and soyabeans were grown and harvested green, this being dictated by their lateness. It is clear, therefore, that in such areas there can be no economic justification for off-season cropping although green manuring might be worthwhile provided that the crop could be established cheaply.

Experiments in Malacca

The high cost of hand construction of raised beds for off-season cropping suggested that this practice would not become popular unless it could be mechanized. Accordingly a depth of cultivation and off-season cropping trial was laid down in 1948 at the Paddy Experiment Station, Pulau Gadong, and continued for five years. The main treatments in this trial were deep (8 in.) and shallow (4 in.) cultivation for the paddy crop but there were four sub-treatments:

Off-season fallow
Green manure cultivated
Groundnuts
Sweet potatoes.

In no season were there differences in yield of paddy caused by these sub-treatments and, during the experimental period, average yields fell steadily as indicated below:

Season	*Mean Yield of Paddy (lbs. per acre)*
1948–49	2,063
1949–50	1,825
1950–51	1,655
1951–52	1,292
1952–53	1,327

This fall in yield was attributed to the necessity for carrying out mechanical operations on land which was not always in a suitable condition. Certainly there was a deterioration in soil structure and it was concluded that mechanization was impracticable under such conditions.

It is interesting to note that off-season cropping has been practised on Malacca paddy fields for upwards of 37 years but the Chinese cultivators take great care in the hand preparation of the raised beds (1).

The Use of Green Manures for Paddy

The cultivation of green manures on paddy land is a well established practice in certain countries but it has never found favour in Malaya. In the north the clay soils dry out after paddy harvest and deep cracks develop as the water-table falls. Elsewhere paddy land is often alternately dry or subject to floods of short duration and this favours the rapid growth of a natural sedge flora. Where the surface soil is an organic clay or muck the succulent-stemmed sedge, *Scirpus grossus (menderong)*, is frequently dominant and this is well recognised in Perak as an indicator plant of first–class paddy land.

On the one hand, there are conditions militating against the cultivation of leguminous green manures and on the other hand conditions favour the natural growth of a non-leguminous, but very bulky sedge crop which adds considerable quantities of organic matter to the land. It is perhaps not surprising, therefore, that the active cultivation of green manures has not found favour with Malayan paddy growers: rather do they prefer to graze the dry lands of the north, to grow cash crops on the occasional favoured field in Selangor or let the natural sedge growth develop unaided.

In the past many experiments have been designed and laid down in order to demonstrate the hypothetical value of green manures but almost without exception these have failed because the green manure crops either failed completely or else grew poorly and were swamped with a growth of grasses and sedges.

In 1952 it was realized that no progress could be made unless green manure crops could be found which would grow fairly reliably. It was then decided to lay down observation plots with the most promising of these and the following short list was selected in the light of previous experience:

Crotalaria juncea – Sunn Hemp
C. striata
Tephrosia noctiflora
Sesbania aculeata – Daincha
S. *speciosa*
S. aegyptiaca
S. roxburghii

By the end of 1924 it had been established that only *Sesbania aculeata* and *S. speciosa* deserved further attention since both species had proved to be resistant to flooding once they had reached a moderate size and the former was also resistant to drought. Accordingly a trial was laid down on five stations to study the effect of broadcasting germinated seed of *S. aculeata* into the growing crop of paddy one week before harvest. At the same time the effect of manuring the paddy with NPK was incorporated factorially into the layout. This experiment will be continued for three seasons but it is of interest to note, in 1955, that the green manure grew well at only one station, grew unevenly at another locality and failed to grow at the other three sites because of lack of rain.

Discussion

Where wet paddy can be grown in rotation with some other crop in the off-season this practice is clearly of benefit as it is sound farming policy and appears to help in weed control. Such off-season cultivation may also benefit the subsequent paddy crop, this effect being one of improved cultivation rather than a manurial one. In most areas, however, comparable increased yields of paddy can be obtained by direct manuring and off-season cultivation can only be justified by the immediate returns from the crop and not from the delayed returns from the subsequent crop of paddy.

We have seen that, in Malaya, rotation of paddy with a dry land crop is at present only possible in certain limited favoured areas. That it could be extended somewhat in these localities is clear but such extension is restricted by economic factors. Maize is a typical example of a crop with a limited local market: it is usually sold as green cobs and the farmer may receive only 1 to 2 cts. per cob at a time when the retail price in the larger towns is 8 cts. There is admittedly a small market for dried grain but this does not yield the profit to which Malayan small-holders are accustomed. In this connection it is worth noting that a small-holder can easily earn M. $4 (9s. 4d.) per day (October, 1955) from tapping rubber on a share crop basis and such a man would naturally not take kindly to any form of subsistence farming.

Other off-season crops may be more profitable, indeed the return from tobacco may greatly exceed that from paddy, as witnessed by the following figures:

Crop	*Yield per Acre*	*Gross Return per Acre*
Paddy	400 gantangs (50 bushels)	M. $200
Tobacco	800 lbs. dried leaf	480

It is perhaps not surprising that certain industrious Chinese cultivators would prefer that irrigation water be withheld so that dry land crops could be grown throughout the year.

In recent years locally selected soya beans have been giving promising crops on

paddy land and these may well extend the area of off-season cultivation in favourable localities. Jute is another crop which may lead to expansion since promising experimental crops of *Corchorus capsularis* var. *Segama* have been cultivated in Selangor.

Summary

1. Off-season cultivation of dry-land crops is limited in area in Malaya by climatic, soil and economic factors.

2. Cultivation in the off-season usually leads to increase yields from the subsequent paddy crop and manuring sometimes enhances these yields.

3. Injudicious cultivation of paddy land carried out when soil conditions are unsuitable may reduce paddy yields as a result of damage to soil structure. Similar harmful effects may also result from excessively deep cultivation.

4. The successful rotation of paddy with other crops facilitates weed control.

5. There is no indication that the practice of green manuring is likely to become established in Malaya except in so far as the natural weed growth in the off-season is sufficiently dense to be considered a green manure.

Acknowledgement

I am indebted to Mr. P. A. Gething, State Agricultural Officer, Selangor, and to Mr. Mervyn J. Smith, Agronomist, for assistance in the preparation of this article.

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PADDY STEM-BORER INVESTIGATIONS IN KRIAN, PERAK

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The lepidopterous stem-borers (*Chilotraea polychrysa* (Meyr.), *Chilo suppressalis* (Walk.), *Schoenobius incertulas* (Walk.) and *Sesamia inferens* (Walk.), of which the first and third are by far the most common, constitute the most serious pests of paddy in Malaya, yet little is known of their local distribution, factors affecting their abun-

dance, economic losses caused or any practical means of control. Accordingly investigations have been started in 1955 in an attempt to throw light on these problems. Work is presently concentrated in Krian, Perak, where stem-borers normally appear to be a serious problem.

Preliminary visits in 1954 revealed considerable misunderstanding among paddy growers concerning the intensity of attack. When paddy is growing poorly, a cause is sought and borers are invariably found and often blamed, though they may be attacking only a small section of the crop. When growth is good, no trouble is suspected or sought, yet up to 30 per cent of the tillers may be attacked.

To clear up this difficulty and to throw light on numerous other matters such as distribution of borers, a survey has been undertaken to make periodic visits to 45 points on a grid covering the whole area. The first visits were made during the off-season to determine the distribution of weed vegetation and, subsequently, its effect on borer distribution. Distinct plant communities were found occupying strips roughly parallel to the coast and corresponding with soil fertility. Two aquatic grasses (*Panicum amplexicaule* and *Echinochloa crus-galli*) were found to be alternative hosts of borers, but these were not common enough to be considered important means of carrying borers over through the off-season. Volunteer paddy constituted about 2 per cent of the off-season vegetation, usually heavily attacked and thus providing an ample source of infestation for the next season.

A second round of the sites was made in mid-October 1955 when paddy had been transplanted two months. A distinct band of borer infestation could be mapped, passing right across the bands of off-season vegetation. Borer infestation cannot therefore be correlated with the latter, nor with soil fertility. There is a suggestion from the figures obtained that borers may be associated with shallow water. In this band of attack an average of 3.31 per cent of the tillers were bored, compared with 0.66 per cent in the rest of the area.

Six of the sites have been selected to be visited at monthly intervals, to follow the build-up of borer attack. In the nursery and for some time after trans-planting, borers were attacking under 1 per cent of the stems. Then, two months after transplanting, the percentage rose suddenly to 4.5, and a month later to about 10.

A light trap has been set at intervals at Titi Serong Paddy Station to determine the fluctuations in the abundance of borer moths throughout the season. During the late off-season, and for seven weeks after transplanting, catches were very low. Then came a sudden increase, when an average of 77 borer moths (*C. polychrysa* and *S. incertulas*) was caught each night. This increase seems to correspond with the increase in larval attack noted above.

Pot experiments in Kuala Lumpur have indicated that insecticidal control of borers may be an economic possibility, and also that the timing of applications must be accurately adjusted to protect the paddy at its most vulnerable stage: probably just

before flowering. Three randomized block field experiments have therefore been carried out to discover the most advantageous time for treatment, using DDT at 1 lb. per acre. Included in these experiments was a treatment aimed at excluding borers as far as possible, by 2 weekly sprayings, in order to determine the actual losses caused by borers. At 12 weeks after transplanting, the percentages of tillers bored in the untreated plots of two of these experiments were already 11.8 and 21.6, while in the treated plots damage had been kept down to 1.8 and 2.7 percent respectively.

It is hoped that further experiments will be carried out on the kind of insecticide and the rate of application in order to determine the most economic means of control.

Observations have been made on two variety trials in the Botany Division. Although borer attack was not yet heavy, it is obvious from the counts in one experiment that some varieties are more susceptible to attack than others. Serendah Sungei Dua 42 and Nachin 5057 had 8.1 and 7.0 per cent of the tillers bored respectively, while Serendah Sungei Dua 25 and Mayang Tekai 41 each had only 2.6 per cent attack. It is of interest to note that such large differences in susceptibility between selections exist within the same variety.

Paddy field fish are a major source of income to the Krian paddy growers, and, since most insecticides are highly toxic to fish, this presents a major obstacle in the use of insecticides for borer control. Experiments have therefore been carried out in the laboratory to determine the toxicity of various insecticides to fish. The median lethal concentration for 20 hours of continuous exposure has been determined for young *Ophiocephalus striatus* as follows:

Endrin (as 19.5 per eent emulsifiable concentrate)	– 0.00045	p.p.m.
Dieldrin (as Dieldrex 15, 15 per cent)	– 0.0079	p.p.m.
DDT (as 25 per cent emulsifiable concentrate)	– 0.040	p.p.m.
Gamma-BHC (as Gammalin liq. conc. 10 per cent gamma) approx.	– 0.7	p.p.m.
Gamma-BHC (as Agrocide wettable powder, 6.5 per cent gamma)	– 0.32	p.p.m.

The results of the experiment confirm those obtained in 1954 that Endrin and Dieldrin are too toxic for use at the normal rate of application ($\frac{1}{2}$ lb. – 1 lb. per acre) though Dieldrin may be safe when the paddy is dense and little spray reaches the water. DDT and BHC would normally be safe to use. Endrin was found from tests in Selangor to be very toxic to ducks as well as to fish.

The solvent oil appears to be a contributing factor in the toxicity of insecticides, while an unknown constituent of Agrocide wettable powder seems to have an antidote effect both for gamma-BHC and Dieldrin.

REVIEW OF THE REPORT ON RICE INVESTIGATIONS IN THAILAND 1950-54 BY DR. H.H. LOVE

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The program of rice improvement reported in this publication was a cooperative project between the Thailand government and the International Cooperation Administration of the United States of America. Dr. H.H. Love, author of the report, held the direction and control of the program throughout the period under review. Thailand has already the reputation for producing long-grained high quality rice much in demand in world markets, and the objective of the new program was to discover or develop by breeding still better rice varieties of high quality and yield.

A large scale project of rice breeding requires a large number of men trained in the technique of designing, conducting and handling the details of various kinds of field experiments, and Thailand did not have them. Dr. Love therefore decided as a first step to train the men locally by instituting special short courses which he had found quite successful in China. The subjects dealt with in the short courses were plant breeding, genetics, statistical methods and field plot technique. The men taking the short course were some staff members, some students of the agricultural university and a large number of agricultural extension agents of the government. The first course given in 1950 was repeated in 1952, 1953 and 1955. The idea was to hold the course periodically until most of the men having anything to do with experimental work or handling demonstration tests or seed multiplication work have had an opportunity to attend. In fact many trainees had taken the course more than once or twice. Some of the trainees of the first course had actually assisted in conducting experiments and later learnt to analyse and interpret the results.

Besides the training course some of the men were sent to neighbouring countries under the direction of a staff member to observe and learn methods followed. A selected few were also sent to the United States for a short period of training in rice production, breeding, fertilization, storage, grading and the like. Staff members likewise had on-the-job training by working with the U.S. technicians assigned to the project.

The breeding project consisted of three phases: (1) variety evaluation, (2) selection and (3) hybridization.

Variety evaluation The first step in every comprehensive breeding program, consisted in testing systematically all the standard varieties on hand not only at the experiment stations but also in different rice growing regions of the country under cultivators' conditions. This evaluation which began with 100 varieties was later extended to varieties collected by agents in different parts of the country and also those introduced from other countries. The testing was done by grouping varieties

according to their maturation period, whether non-glutinous or glutinous and whether ordinary or floating rices. These trials also included varieties which had won prizes in exhibitions as rice of the best quality. The trials were conducted in three regions, central, north and northeast, as the soil and climatic conditions are distinct in these regions. The number of regional variety tests have been steadily increased as men trained to handle the details and supervise such tests became available. In 1954 there were actually 88 tests besides those on experiment stations, and several hundreds of varieties have so far gone through this testing. Some of the outstanding results that have come out of these trials so far are: (1) many varieties now being grown by the farmers were poor in yield and an improvement of 20 per cent in yield was possible by substituting these varieties by those standard varieties developed at the experiment stations; (2) quality of rice alone was not a satisfactory basis for deciding on what varieties to grow; (3) a few of the new varieties collected in the region were of outstanding merit, and (4) often within a small range of conditions too many varieties were being grown by farmers for no special reasons, and the substitution of these by a limited number of high yielding varieties would facilitate trade, an important consideration for a rice surplus country such as Thailand. Among the foreign varieties only a few, particularly those from the U.S.A. (originally imported from China) were of sufficient merit.

Selection This had been done on an extremely limited scale prior to 1950, but it was multiplied serveral fold in this new joint undertaking. The agents trained in the short courses were each asked to visit 20 farms or fields in the area where they were located, and select 100 to 200 single heads from each field. This single head collection amounted to 120,000 in 1951, 95,000 in 1952 and another 22,000 in 1954. The technique of dealing with such a large number of selections and gradually weeding out the poorer ones by objective tests have all been worked out, and the testing is all done at the experiment stations which, since the starting of the program, have been increased to eight to represent the distinct rice growing regions of the country. All of them are suitably equipped and staffed and two more experiment stations will be added.

About 680 of the more promising lines of the first batch of selections have already been brought under yield trials using standard varieties of the region as controls. A large number of them record higher yields than the control, and in a few cases the yield increase is as much as 20 to 50 per cent. The work has shown remarkably well the large scope that still exists for improving local varieties by selection provided the selection was done on a sufficiently intensive scale.

Hybridization The necessity for hybridization and how and when it should be undertaken is also discussed. At present the hybrid material under study consists mostly of what has come out of the FAO hybridization project and even here several thousands of progenies have been taken to

F_4 stage although the yield testing stage has not been reached. There are also other crosses within local varieties under study.

This publication deals with selection and varietal testing in Thailand on a scale never attempted so far in any of the countries in South East Asia. While the position may vary from country to country this report does challenge the opinion sometimes expressed by rice breeders that there was no scope for improving their varieties by selection. The most useful part of the report is the information provided on the techniques that may be followed at every stage of testing selections and varieties which usually cannot be found in any text book. The statistical principles involved are briefly discussed and there is a valuable concluding portion on methods, correlations, competition effects, etc. There is no doubt that the report should prove a valuable guide book to all rice breeders.

LIST OF ARTICLES PUBLISHED IN THE NEWSLETTER DURING THE YEAR 1956

Only a limited number of copies of certain previous issues of the News Letter since its first publication in 1952 are still available. Those interested in obtaining copies should address the Executive Secretary, International Rice Commission, c/o FAO Regional Office, Bangkok, Thailand, indicating the specific number of the issues desired.

Issue No. 17 – March, 1956

1. Summary Report of the 1955 Meetings of the Two Working Parties of the International Rice Commission.
2. Changes in Rice Varieties in the United States from 1931 to 1955, by C. Roy Adair.
3. Sampling and Analysis of Paddy Soil, by B.L. Beacher.
4. Rice Rotations in New South Wales, by W. Poggendorff.
5. Rice Breeding in Surinam.
6. Foliar Symptoms of Defficiencies of the Major Elements in Rice, by R.G. Lockard.

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7. Cooperative Rice Improvement Program in the Philippines, by D.L. Umali, J.P. Torres and others.
8. The Effect of Crop Rotation on the Growth and Yield of Rice in the United States, by C. Roy Adair.
9. Research on Penyakit Merah in Malaya, by R.G. Lockard.
10. Wet Padi Manurial Experiments on Peat Soils in Malaya, by E.F. Allen and J.K. Coulter.
11. Estimation of Crop Losses in Paddy in Malaya due to Insects, by R.J.A. W. Lever.

12. Investigations on the Time Application of Ammonium-Sulphate, by H. Siregar.

Issue No. 19 – September, 1956

13. Rice Experiment Stations in India, by R.L.M. Ghose.
14. Rice Diseases in India, by S.Y. Padmanabhan.
15. Fertilizer Use in Rice Production in India, by M.V. Vachhani and C.T. Abichandani.
16. Insect Pests of Rice in India and their Control, by P. Isreal.
17. The Fifth Session of the International Rice Commission, Calcutta, India, 12 to 19 November, 1956.

Issue No. 20 – December, 1956

18. Summary of Recommendations of the Fifth Session of the International Rice Commission, held in Calcutta, India, 12 to 19 November, 1956.
19. Summary of Recommendations of the Meeting of the *ad hoc* Working Group on Storage and Processing of Rice.
20. Progress Report on the Work of the International Rice Commission, by C.W. Chang.
21. A Summary Report on Rice Improvement in Egypt in 1955, by M.A. Koshiary, C.L. Pan, M. Gad El Hak and others.
22. The Effect of Crop Rotation on Growth and Yield of Paddy, by E.F. Allen.
23. Paddy Stem-Borer Investigations in Krian, Perak, by I.J. Wyatt.
24. Review of the Report on Rice Investigations in Thailand, 1950-54, by H.H. Love, by K. Ramiah.
25. List of Articles Published in the Newsletter During the Year 1956

Printed and Published by
Mrs. Prayat Jataputra
at Udom Press
395-401 New Road, Bangkok.
16/1/2500